Cambridge
O Level

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BIOLOGY **5090/22**

Paper 2 Theory **October/November 2016**

MARK SCHEME

Maximum Mark: 80

Published

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Mark schemes will use these abbreviations:

;	separates marking points
/	alternatives
()	contents of brackets are not required but should be implied
R	reject
A	accept (for answers correctly cued by the question, or guidance for examiners)
Ig	ignore (for incorrect but irrelevant responses)
AW	alternative wording (where responses vary more than usual)
AVP	alternative valid point (where a greater than usual variety of responses is expected)
ORA	or reverse argument
underline	actual word underlined must be used by candidate (grammatical variants excepted)
+	statements on both sides of the + are needed for that mark

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Question	Answer	Mark	Guidance
1(a)(i)	yeast / fungus / *Saccharomyces* ;	1	
1(a)(ii)	carbon dioxide / CO_2 ;	1	
1(b)(i)	starting at zero ; line above that on graph at least up to (the drawn line's) peak ; peaking earlier (than dotted line on graph) ; reaches same height as dotted line ;	3	
1(b)(ii)	pH ; substrate (or named carbohydrate) concentration / amount ; toxins / named toxin ; amount of yeast / microorganism / strain A / strain B ; competing microorganism **AW** ; pressure / (presence of) oxygen ;	2	**Ig** minerals / vitamins **A** alcohol as named toxin

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Question	Answer	Mark	Guidance
1(c)	(strain A): 1 produces high volume / amount + CO_2 / gas ; 2 quick(er) process ; 3 CO_2 / gas makes the dough rise **AW** / trapping of CO_2 / trapping of gas / improves texture ; 4 flavour suitable for bread **AW** ;	**3**	no mark awarded for strain A **A** gives sweet taste
	Total:	**10**	

Question	Answer	Mark	Guidance
2(a)	C – style / pistil / carpel / gynaecium ; D – petal / corolla ; E – anther / stamen / androecium ; F – fruit / pericarp ;	**4**	
2(b)(i)	H – CO_2 / carbon dioxide ; J – O_2 / oxygen / water <u>vapour</u> ;	**2**	

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Question	Answer	Mark	Guidance
2(b)(ii)	K – O_2 / oxygen ; L – CO_2 / carbon dioxide / water <u>vapour</u> ; no chlorophyll / no chloroplasts ; no photosynthesis ; respiration ; **A** transpiration if water vapour given for L ;	**2** **2**	
2(c)	neutralises (stomach acid) / raises pH **AW** ; may kill / destroy (harmful) bacteria ;	**2**	
	Total:	**12**	

Question	Answer	Mark	Guidance
3(a)(i)	<u>nicotine</u> ;	**1**	
3(a)(ii)	tar / named carcinogen ;	**1**	**A** any other named carcinogen in tobacco smoke
3(a)(iii)	carbon monoxide / CO ;	**1**	
3(a)(iv)	1 carbon monoxide combining with haemoglobin / nicotine narrows blood vessels ; 2 decreasing O_2 carriage / less O_2 absorption ; 3 substances pass from mother's blood to fetus' blood / reference to substances across placenta ; 4 impaired development / born underweight / stunted growth / damage to brain / stillbirth / premature birth ;	**3**	
3(b)	1 both rise + until 1950 ; 2 people unaware of the link / education **AW** ; 3 1950 / 60 – 1980 + fall in smoking + continued rise in	**4**	

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Question	Answer	Mark	Guidance
	deaths ; 4 cancer can take a long time to develop **AW** ; 5 due to passive smoking / cancer caused by other factors ; 6 since 1980 **+** both falling ; 7 better diagnosis / treatment / drugs ; 8 low tar cigarettes / better filters / e-cigarettes ;		
	Total	**10**	

Question	Answer	Mark	Guidance
4(a)(i)	Left Ventricle / helps blood flow or pressure ;	**1**	
4(a)(ii)	muscle ;	**1**	
4(a)(iii)	aorta ;	**1**	
4(b)(i)	arrow in or towards heart in vena(e) cava(e) ; arrow towards heart in pulmonary vein(s) ;	**2**	**A** only one vena cava / pulmonary vein annotated **R** if arrows in these vessels contradict
4(b)(ii)	arrow right to left through LVAssist Device / in tube M / N ;	**1**	**R** if arrows contradict
4(c)	aortic / semi-lunar ;	**1**	

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Question	Answer	Mark	Guidance
4(d)	right ventricle ; pulmonary artery ;	2	
	Total:	9	

Question	Answer	Mark	Guidance
5(a)	1 bacteria (or correctly named) + roots / nodules ; 2 fix / convert / turn + nitrogen ; 3 ploughing / digging into soil ; 4 decay / decompose ; 5 (which produces) nitrates / nitrites / ammonium ;	2	**Ig** ammonia
5(b)	fibrinogen / fibrin ;	1	**A** thrombin / prothrombin / (pro)thrombokinase / factor VIII
5(c)(i)	increase ; no change + (from 2000) to 2002 / 3 / 4 / first 2 years / first 3 years / first four years ; exponential or described / more quickly **AW** ;	2	
5(c)(ii)	1 mutation / change / variation ; 2 reference to genes / DNA ; 3 resistance (to poison) / better adapted ; 4 survival ; 5 breeding / reproduction / produce offspring ; 6 natural selection / evolution ; 7 greater amount (of dicoumarol) now required to kill / used to kill / the LD_{50} must be increased ;	4	
	Total:	9	

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Question	Answer	Mark	Guidance
Section B			
6(a)	1 light / rays **+** bent / refracted / converged **;** following points must be related to, or imply, the idea of light / rays (accept image) passing through: 2 cornea **;** 3 pupil **;** 4 aqueous / vitreous humour / bodies **;** 5 lens **;** 6 (lens has) less ability to change shape **AW** / accommodate **;** 7 (therefore lens unable to bulge) fully / enough **;** 8 (lens) cannot refract sufficiently / decrease focal length sufficiently **AW ;** 9 (cannot focus on the) retina / fovea / yellow spot **;**	**7**	
6(b)	1 convex (reference to spectacle lens) **AW ;** 2 (light / rays) bend / refract / converge **;** 3 before entering eye / (eye) lens **;** 4 compensate for thinness / lack of convexity or fatness in eye lens **;** 5 (to focus on the) retina / fovea / yellow spot **;**	**3**	
	Total:	**10**	

7(a)	1 adrenaline **;** 2 glycogen to glucose **;** 3 liver / muscles (in context of adrenaline effect) **;** 4 boosts blood glucose / sugar levels **;** 5 fast(er) heart beat **;** 6 better / faster circulation **;** 7 more oxygen **+** to muscles **;**	**8**	

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Question	Answer	Mark	Guidance
	8 more glucose + to muscles ; 9 faster respiration / faster metabolism / more energy released ; 10 faster / deeper breathing ; 11 more O_2 into blood ; 12 better removal of CO_2 ; 13 reference to sweating / vasodilation ; 14 to cool down / lose heat / maintain body temperature ;		
7(b)	anaerobic respiration ; lactic acid ; removed / broken down / oxidised ; needs oxygen / reference to oxygen debt ;	**2**	
	Total:	**10**	

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Question	Answer	Mark	Guidance
Section C			
8(a)	(similarities) 1 large surface area / both elongated structures **AW ;** 2 active transport / require energy / against concentration gradient **;** 3 both in solution **;** 4 both require a membrane **;** (differences) 5 root hairs **;** 6 villi **;** 7 root hairs are single-celled **;** 8 villi are multicellular **AW ;** 9 through cell walls in plants **ORA ;** 10 ions absorbed from the soil **;** 11 glucose absorbed from / in the intestines / digestive system **;**	**max 6**	
8(b)	1 plants use nitrates **;** 2 (and) carbohydrates / products of photosynthesis **;** 3 to make their own amino acids / **ORA ;** 4 humans rely on proteins **+** from other organisms **;** 5 have to be ingested / eaten / consumed **;** 6 have to be digested to amino acids **;**	**4**	
	Total:	**10**	

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Question	Answer	Mark	Guidance
9(a)	1 named mosquito-borne disease ; 2 vector ; 3 parasite / pathogen / *Plasmodium* ; 4 female (mosquito) ; 5 bites / feeds on + infected person ; 6 picks up parasite / pathogen ; 7 (transferred) to uninfected person ; 8 sucks blood / blood meal **AW** ; 9 injects / transfers + parasite / pathogen ;	**5**	**A** malaria, dengue, West Nile virus, chikungunya, yellow fever, filariasis / elephantiasis, encephalitis, Zika fever **A** bacterium / virus / protozoan / protoctist
9(b)	any named (different) disease + correct dietary deficiency ; any symptom correctly linked to a disease / deficiency ;	**3** **2**	
	Total:	**10**	

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